

**Abstract of the Disclosure**

5 Genes and methods for optimizing levels of substrates employed in the  
biosynthesis of copolymers of 3-hydroxybutyrate (3HB) and 3-hydroxyvalerate  
(3HV) in plants and bacteria via manipulation of normal metabolic pathways  
using recombinant DNA techniques are provided. This is achieved through the  
10 use of a variety of wild-type and/or deregulated enzymes involved in the  
biosynthesis of aspartate family amino acids, and wild-type or deregulated  
forms of enzymes, such as threonine deaminase, involved in the conversion of  
threonine to P(3HB-co-3HV) copolymer endproduct. By these methods,  
enhanced levels of threonine,  $\alpha$ -ketobutyrate, propionate, propionyl-CoA,  
 $\beta$ -ketovaleryl-CoA, and  $\beta$ -hydroxyvaleryl-CoA are produced. Also provided are  
15 methods for the biological production of P(3HB-co-3HV) copolymers in plants  
and bacteria utilizing propionyl-CoA produced through a variety of engineered  
metabolic pathways. Introduction into plants and bacteria of an appropriate  
 $\beta$ -ketothiolase,  $\beta$ -ketoacyl-CoA reductase, and PHA synthase, alone or in  
combination with various enzymes involved in aspartate family amino acid  
20 biosynthesis and the conversion of threonine to PHA copolymer precursors, will  
permit these organisms to produce P(3HB-co-3HV) copolymers.

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